Last Lecture Summary

- **Relational Integrity**

  Domain :

  not null, unique, default, check

  Entity :

  primary key

  Referential :

  foreign key

  Enterprise :

  specific constraints

Relational Database Design

Basic elements of design process:

- Defining the problem or objective
- Researching the current database
- Designing the data structures
- Constructing database relationships
- Implementing rules and constraints
- Creating database views and reports
- Implementing the design

Features of Good Relational Design

- Reduce redundancy
- Easy access to data
- More accuracy and integrity of information
- Data entry, updates and deletions should be efficient.

Bad Database design may lead to:

- Repetition of information
- Inability to represent certain information
- Consist of anomalies – Insertion, Deletion , Updation /Modification

Anomalies

Insert new branch info

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Delhi
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi
117	Ganesh	40,000	B003	Mumbai
NULL	NULL	NULL	B004	Pune

Insert Anomaly

Anomalies

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Delhi
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi
117	Ganesh	40,000	B003	Mumbai

Delete Emp_no 117

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Delhi
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi

One branch information is lost

Delete Anomaly

Anomalies

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Delhi
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi
117	Ganesh		03	Mumbai

Update branch_add to Chennai for B002

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Chennai
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi

Require multiple update if not done ?

Update Anomaly

Normalization

- Normalization is a database design technique which is used to organize the tables in such a manner that it should reduce redundancy and dependency of data.
- It divides larger tables to smaller tables and links these smaller tables using their relationships.

- Types of Normalization-
  - First Normal Form (1NF)
  - Second Normal Form (2NF)
  - Third Normal Form (3NF)
  - Boyce-Codd Normal Form (BCNF)
  - Fourth Normal Form (4NF)

Decomposition

Definition -

The decomposition of a relation schema

$R = \{A1, A2, ..., An\}$

is its replacement by a set of relation schemes

$\{R1, R2, ..., Rm\}$

such that

$Ri \subseteq R$ for $1 \leq i \leq m$

and $R1 \cup R2 \cup .... \cup Rm = R$

Decomposition Example

R = { Emp_no, name, salary, branch_no, branch_add}

Decompose into

R1 = {Emp_no, name , salary}

R2 = {branch_no, branch_add}

Where R1⊆ R and R2⊆ R and R1∪ R2 = R

Decomposition Example

STDINF ={Name,Course,Ph_No,Major,Prof,Grade}

Decompose

Student = {Name, Ph_No, Major}

Teacher = {Course, Prof }

Course = {Name, Course, Grade}